In the specification:

Please substitute the following paragraphs for the paragraphs at the indicated locations in the specification as originally filed or most recently amended.

Page 2, line 10+:

Many designs for fiber optic interferometric sensors are known and many variations and implementations have been developed. However, the basic arrangement of the most successful of these designs generally involve the formation of a reflective surface near the end of a fiber optic cable which is used to both supply light to the sensor from a remote location and return light to the remote location after it is passed through the sensor. The basic principle of operation of such sensors is that the end of the fiber optic ~~able~~ cable provides a partially reflecting surface allowing some light to pass to and be reflected by a further reflective surface spaced a very short distance from the end of the fiber optic cable thus forming a gap between reflecting surfaces. The sensor is configured in such a way that the length of the gap is variable with the parameter of interest. Thus the light reflected from the respective surfaces will have two components; one delayed with respect to the other and which will form an interference pattern in which regions of reinforcement or cancellation will be observable and which will vary strongly with potentially minute changes in the gap length. Other arrangements using other phenomena such as wavelength separation are also known.

Page 3, line 2+:

To provide for the gap length to be reliably established while allowing variation thereof with any of a plurality of parameters of interest, the sensor

structure of choice generally and most basically comprises a tube with optical fibers inserted into opposite ends thereof to be aligned in close proximity while forming a gap and the tube bonded to the respective optical fibers to fix the relative positions of the optical fibers. However, the important physical feature of a fiber optic sensor of this type is the gap between reflective surfaces and the ~~glass~~ tube housing, while generally convenient, is not necessary to the basic principles of a fiber optic sensor.

Page 3, line 16+:

An important and frequently desirable measurement for which design of sensors of any type is difficult is that of sensing flow rate ~~of~~ or shear stresses caused by fluid flow over a surface. For example, a significant fraction of the total resistance to motion of airplanes and ships is due to surface or skin friction while the availability of skin friction transducers is limited. ~~while~~ Further, incidental effects of temperature and pressure ~~which~~ are also generally unavoidable (e.g. due to Bernoulli and frictional heating effects) when measuring fluid flow across a surface. It is also very difficult to apply a sensor of any type to such a measurement, especially if direct measurement of skin friction or flow rate is to be made consistent with minimal interference with the measured parameter. Whether measurement of fluid flow rate/velocity or skin friction/shear forces are made directly or indirectly, the sensor must necessarily intrude upon the interface of the surface and the fluid ~~flow~~ and can thus potentially disrupt the parameter being measured and may not be reliable except in particular flow regimes. For example, Stanton tubes, Preston tubes and surface hot wire techniques are not reliable for complex three-dimensional or otherwise irregular flows (e.g. due to irregular surfaces,

injection or suction of fluids or impinging shocks and direct measurements usually involve a floating head replacing a portion of the surface over which the flows take place or extending into the flow which is difficult, if not impossible, to provide without introducing at least irregularities in the surface. In general, however, direct measurements are less intrusive upon the flow regime and are thus generally preferred.

Page 5, line 7+:

However, a floating head, non-nulling fiber optic sensor for flow rate and shear forces is known an disclosed in the above-incorporated U. S. Patent 6,246,796. This sensor uses a cantilevered arm to support a tethered floating head and uses fiber optic cables to conduct light to be reflected from surfaces of the floating head or parts of the support therefor. To provide temperature compensation, two or more optical fibers are symmetrically placed on opposing sides of the cantilever such that variations in geometry due to temperature will occur at both measurement gaps and can be approximately compensated by processing (e.g. subtracting) to remove the common mode component from both measurements. However, it is recognized in that disclosure that the floating head, even if tethered, may remain more subject to displacement from pressure than from shear forces and the sensor relies upon relatively greater stiffness along the length of the cantilever than in the direction of motion of the floating head to counteract effects of pressure. This patent also acknowledges ~~that~~ extrinsic Fabry-Perot interferometer (EFPI) sensors using a construction including a glass tube for respectively locating the ends of partially reflecting fiber optic elements as discussed above but also notes that slight pressure sensitivity remains.

Page 8, line 21+:

Two fiber optic cables 40 are provided and ~~positions~~ positioned to form gaps 45. The lengths of these gaps can be monitored in several known ways including interferometric techniques discussed above. It is contemplated that shear forces will cause slight bending of the cantilever such that one gap will be increased while the other will be decreased; the difference indicating direction and velocity of the fluid flow. At the same time, changes in the gap length due to temperature will cause substantially equal changes in the gap length which can be removed from the data by suitable processing (e.g. subtraction). Thus, the sensor system of U. S. Patent 6,246,796, may allow compensation for changes in temperature.

Page 9, line 3+:

Referring now to Figure 2, the sensor 100 (sometimes referred to as a transducer) in accordance with the invention will now be discussed. The principal structural difference between the invention, as illustrated in Figure 2 and the prior art sensor of Figure 1 is that integral sensors 110, preferably comprising a tube for positioning the reflective surfaces of (preferably single mode) optical fibers defining one or more gaps 150 (or other structure forming a reflector closely spaced from a preferably flat end of a lead-in optical fiber), are provided substantially parallel to a cantilever 120 between a reference surface 140/140' and a floating head 130 or along and between the ends of the cantilever or other structure (e.g. multiple cantilevers providing substantial parallelism between a fixed end and a floating head) having a fixed end and a displaceable end in place of the (e.g. cantilevered) fiber optic cable (40 of Figure 1) forming an air gap with the

reflector which moves with the surface subjected to fluid flow. In other words, in accordance with the invention, forces ~~of~~ <u>on</u> surface 130 causing deflection of cantilever 120 are transferred to integral sensors 110 which may be of the EFPI type. Further, in a manner similar to that of Figure 1, effects due to temperature can be compensated by common mode rejection processing as discussed above as well as developing enhancements of self-compensation by the transducer structure while effects of pressure can also be compensated by common mode rejection processing of the integral sensor outputs.

Page 10, line 1+:

However, it has been recognized by the inventors that motions of surface 120 (and consequent changes in sensor output) due to variations in pressure can also be compensated by common mode rejection processing of the sensor output. Further, this effect can be enhanced and the pressure compensation made arbitrarily accurate in combination with self-compensation of the sensor for variations in temperature. Specifically, while it is known that a fiber optic sensor using a tube for reflective surface positioning, as in the EFPI type of sensor, can be made substantially insensitive to temperature by closely matching the coefficients of thermal expansion (CTEs) of the tube and the fiber optic elements, a similarly arbitrary degree of temperature insensitivity of a flow sensor configured as shown in Figure 2 and including two sensors can also be made substantially temperature insensitive by closely matching the CTEs of the sensor and the cantilever structure 120. (The illustration of the sensor in accordance with the invention is inverted in orientation relative to the illustration of the sensor of Figure 1, with the floating head at the bottom. However, the orientation of the sensor of either Figure

1 or 2 is substantially irrelevant to its operation, although some calibration for gravity effects may be desirable.) The material of the cantilever is not critical to the practice of the invention but alloys are generally preferred, particularly since alloys can be freely chosen to provide a desired CTE over a relatively wide range. Thus, essentially no forces which are due to temperature variation affect the length of the sensor gap and the CTEs of the tube and the fiber optic elements can be arranged in combination with other geometry of the sensor such that gap variations of the respective sensors are each effectively canceled to provide substantially complete self-compensation for temperature.

Page 11, line 6+:

To whatever degree such self-compensation for temperature may be accomplished. It should be understood that minimization of temperature sensitivity is helpful and considered advantageous but not necessary to the successful practice of the invention to provide both temperature and pressure self-compensation. In a sensor configuration as is shown in Figure 2, both temperature and pressure will act substantially equally on both/all of sensors 110 and can thus be easily compensated by common mode rejection processing of the sensor outputs, particularly if temperature sensitivity is minimized as discussed above. This effect and the overall accuracy of the sensor in accordance with the invention in regard to flow rate and shear force measurement (as well as freedom from the production of effects which can interfere with the measurement accuracy) is significantly enhanced by the stiffness of the sensors, which are preferably closely matched in response characteristics to temperature and pressure, in accordance with the invention and can thus more

substantially support a floating head structure in a substantially stationary position to avoid perturbation of the surrounding flow regime while avoiding any forces passed through the sensors from being reflected in the processed output. It should be appreciated that this quality of the flow rate/shear force sensor in accordance with the invention performs very similarly to the nulling type of sensor (in which the floating head is returned to very near its unloaded or ~~neutrl~~ neutral position by a feed-back arrangement but which necessarily requires some slight positional error on which to operate) while avoiding the complexity thereof.